# HABITAT CONDITIONS

### **Dams and Levees**

The greatest impoundment influence within the South Grand Watershed is Truman Reservoir which is impounded by Truman Dam located near Warsaw, Missouri and impounds 39% of the original South Grand River (MDNR 2002b). Initially authorized by the Flood Control Act of 1954 under the name of Kaysinger Bluff Reservoir for the purpose of flood control; the project purpose was later modified by the Flood Control Act of 1962 to include hydroelectric power generation and recreation (USACOE 1980). The project was designated Harry S Truman Dam and Reservoir in 1970. Completed in 1979, Truman Reservoir has a multipurpose pool elevation of 706 feet above mean sea level (msl) and a surface area of 55,600 acres (approximately 20,392 acres in the South Grand Watershed) (USACOE 2002). The Flood control pool of Truman is 739.6 feet above msl with a surface area of 209,300 acres (approximately 76,356 acres in the South Grand Watershed) making it the largest flood control reservoir in Missouri. At flood control pool, the waters of Truman Reservoir inundate over 30 miles of the remaining South Grand River extending upstream past Urich, Missouri (Figure Hc01).

Section 236.400 of the Missouri Revised Statutes defines a dam as "any artificial or manmade barrier which does or may impound water, and which impoundment has or may have a surface area of fifteen or more acres of water at the water storage elevation, or which is thirty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier or dam, if it is not across a streambed or watercourse, together with appurtenant works" (MGA 2000a).

The Dam Safety Law of 1979 established a "Dam and Reservoir Safety Council" associated with the Missouri Department of Natural Resources (MDNR 2000d and MGA 2000a). The responsibility of this council is to "...carry out a state program of inspection of dams and reservoirs in accordance with regulations adopted by the council" (MGA 2000b). The MDNR Dam and Reservoir Safety Program operates under the guidance of the council. The program is responsible for regulating all new and existing non-federal, non-agricultural dams which have a height of 35 feet or greater in order to ensure that these structures meet minimum safety standards. In order to facilitate this, the program maintains a database on over 4,000 dams within the state to be used by private owners, professional engineers, mining companies, emergency management officials, educational institutions, other government agencies, as well as private individuals (MDNR 2000e). This database includes permitted dams as well as some dams which don't require a permit.

Within the South Grand Watershed in Missouri, there are currently 129 dams which have records within the Dam and Reservoir Safety Program Database (Figure Hc01) (MDNR 2000f). Nearly all of these are reinforced earth structures with heights ranging from 10 to 64 feet. Impoundment surface areas range from 0 to 1,700 acres. The largest of these, 1,700 acre Montrose Lake located on Deepwater Creek, is owned by Kansas City Power and Light.

In an effort to further determine the presence of significant dam and reservoir structures within the

watershed, analysis was performed on National Wetlands Inventory (NWI) GIS data for the watershed. Data was analyzed based on all diked/impounded waters within 100 feet of third order (Strahler) and larger stream segments. This method yielded 469 potentially significant diked/impounded sites. The largest of these sites was 1,435 acres; with the smallest being 0.04 acres (Table Hc01). It is estimated that 229 of these structures are in-stream, based on analysis of their spatial relationship to the 1:24,000 hydrography layer.

Levee construction can have detrimental effects on a stream system. Levees can physically create bottlenecks in the flood plain. This can increase flooding and deposition upstream of the levee and increase flow velocities, flooding, and erosion downstream. Levees also reduce or eliminate connectivity to seasonal wetlands in the floodplain. This can eliminate nursery areas for fish as well as habitat for waterfowl and riparian oriented species. Levees associated with fourth order and larger streams within the South Grand Watershed were located and plotted using GIS through analysis of USGS 1:24,000 scale topographic Digital Raster Graphic (DRG) maps. Through this analysis, it was determined that approximately 42 miles of levees associated with the flood plains of fourth order and larger streams occur in the watershed (Figure Hc01). Most of these levees are located in the agricultural areas of the Lower South Grand and Big Creek flood plains with some occurring within the flood control pool of Truman Reservoir (739.6 feet).

## **Channel Alterations**

Alterations of stream channels by human activity can take several forms including channelization, channel constriction through bridge construction, raising of the base level of the stream by improper construction of low-water bridges sand and gravel removal, etc. All of these activities can adversely affect stream habitat as well as water quality and thus the health of riparian and aquatic communities.

Channelization of a stream involves the straightening, deepening, and/or widening of the stream channel. Frequently, stream channels, in their natural states, have a complex morphology composed of meanders, riffles, and pools. The meanders of a stream help to dissipate the streams energy. A meandering stream also allows surface and ground water within a drainage to be released gradually relative to a straight stream thus allowing for better maintained base flows during dry periods. Channelizing can have several direct and indirect negative effects. These include shortening of the stream, increasing channel gradient of the channelized segment, loss of well defined riffles and pools, increased erosion including headcutting upstream of the channelized segment, increased deposition and flooding downstream of the channelized segment, lowering of the flood plain water table, and a loss of habitat diversity to name a few (Bolton and Shellberg 2001). These impacts can spread to other streams within the respective watershed as well. The aforementioned impacts not only negatively effect aquatic habitats and biotic communities, but can also be damaging to property both up and downstream due to the potential for increased erosion and flooding in these areas respectively.

Estimates based on analysis of <u>National Wetlands Inventory data</u> indicate that approximately 172 miles of channelized streams exist within the South Grand Watershed (Figure Hc01). The majority of these streams are located in the Middle South Grand and Lower Big Creek hydrologic units. The longest channelized stream sections occur on the main stems of the South Grand River and Big Creek. Channelization of the South Grand occurred between 1914 and 1919 in an effort to drain local wetlands and prevent flooding of agricultural land (Gosnell 2002). Today, approximately 44% of the original main

stem of the South Grand is channelized while 39% is inundated by Truman Reservoir (MDNR 2002b). An effect of the South Grand channelization is evidenced by deeply incised road ditches flowing into the South Grand. In addition to the aforementioned channelization, smaller channelization projects have probably occurred on private property and also from road and bridge construction elsewhere in the watershed.

Improper bridge design which alters the normal flow pattern of a stream can also negatively impact a stream. Bridges can restrict stream flow especially at high flows, reducing flow velocities upstream of the bridge, thus increasing sedimentation. They can also increase velocities downstream of the bridge, thus increasing scour/erosion. Improperly designed low-water bridges can alter the base level (that level below which a stream cannot erode) of a stream, thus altering the stream gradient. They can also act as a dam, backing up water behind them and increasing sedimentation on the upstream side. In addition, improperly constructed low-water bridges can act as a barrier to fish movement. According to the Draft Missouri Department of Transportation 2004-2008 Highway and Bridge Construction Schedule, there are currently (2003) four state highway projects tentatively planned which involve drainage and/or bridge construction scheduled within the watershed from 2004-2008 (MDT 2003).

Gravel mining can also directly and indirectly contribute to channel alterations as well as water quality problems. The negative impacts of improper gravel mining have been shown to include channel deepening, sedimentation of downstream habitats, accelerated bank erosion, channel shift, the lowering of the flood plain water table, and the formation of a wider and shallower channel which can result in increased temperature extremes (Roell 1999). The MDNR Incidents of Mines, Occurrences and Prospects Database records four sand and gravel mining sites within the South Grand Watershed all of which are designated as "Past Producers". This would seem to indicate that this type of activity is not prevalent within the watershed.

Many types of activities involving streams and wetlands such as the filling of wetlands, placement of roadfills, construction of dams and the construction of cable or pipeline crossing, just to name a few, require permitting from the COE when they involve "waters of the United States". Additional information regarding the COE Regulatory Program, as well as activities requiring COE permits can be found at http://www.swl.usace.army.mil/regulatory/index.html.

## Logjams

Beginning in 2001, a series of logiams on the South Grand River were removed (MDC Internal File). These logiams, the largest of which was determined to be over a half mile long and located near Urich, Missouri; were believed to be causing flooding upstream (MDC, Internal Memorandum).

### **Natural Features**

The Missouri Natural Heritage Database was created through a cooperative effort between the Missouri Department of Conservation, the Missouri Department of Natural Resources, and the Nature Conservancy in 1981. The purpose of the database is to "identify species and natural communities of special concern within the state and to help establish protection priorities" (MDC 2003). The database, which is updated frequently via input from field biologists, the Missouri Natural Features Inventory,

universities, herbaria, museums, scientific literature, and other organizations; is a dynamic representation of the occurrence of many natural features in Missouri. Currently the database contains 157 features for the South Grand Watershed (MNHP 2003). These include 21 examples of 10 types of natural communities, all of which are classified as terrestrial communities (Table Hc01). Dry-Mesic Limestone/Dolomite Prairies are the most commonly recorded community in the watershed accounting for 5 records within the database. Limestone glades are the second most commonly recorded community with 4 records. While no communities classified as "aquatic" have been inventoried within the watershed, some examples of wetland communities and bottomland forests which are important to aquatic communities have been. These include 1 example each of a freshwater marsh, mesic bottomland forest, and wet-mesic bottomland forest.

A detailed description of the previously mentioned terrestrial natural communities can be found in <u>The Terrestrial Natural Communities of Missouri</u> by Nelson (1987), while a detailed description of Missouri's aquatic communities can be found in <u>Aquatic Community Classification System for Missouri</u> by Pflieger (1989).

Undoubtedly more examples of natural features exist within the watershed. However, due to many circumstances including the limited access to private land and the large land area involved, many features may be as yet unrecorded. Therefore, while the previous listing of features does provide a good cross section of the types of communities which can be found within the watershed, it should not be regarded as final or comprehensive.

## **Stream Improvement Projects**

There are currently two stream habitat improvement projects within the South Grand Watershed. On Settles Ford Conservation Area, 3 grade control structures have been installed on Peter Creek and 2 grade control structures have been installed in the old channel of the South Grand River (McQuillen, personal communication). Another project, on the upper South Grand River in Cass County, includes a low water crossing, 2 floodplain wells/livestock waterers, and riparian fencing (Lanigan, personal communication).

### **Stream Habitat Assessment**

Perhaps one of the more difficult attributes of a watershed to attempt to quantify is stream habitat. This is due to the fact that there are several dynamic characteristics which make up stream habitat. To evaluate all of these characteristics individually and accurately for an entire watershed, is a monumental task and beyond the scope of this document. Thus, the next best thing is to evaluate a characteristic that has the most impact on all aspects of stream habitat. This is, arguably, riparian corridor land cover/land use. Riparian corridor land cover affects many aspects of stream habitat. These include, but are not limited, to water temperature, turbidity, nutrient loading, sediment deposition, in-stream cover, flow, channel width, and channel stability. These in turn have effects on still other characteristics of stream habitat such as dissolved oxygen, cover, spawning areas, etc.

Evaluation of riparian corridor land cover/land use within the South Grand Watershed was accomplished using Missouri Resource Assessment Partnership Land Cover Data (morapmd.wpd). A buffer zone 3 pixels (90 meters) wide was created which corresponded to a 1:24,000 hydrography

coverage for the watershed. Percent land use for each stream segment was then calculated. Land cover/land use categories included forest, wetland, grassland,

cropland, urban, and water. Percentages of these categories were then calculated for riparian corridors within each drainage unit as well as for the whole watershed.

Results from the South Grand Watershed indicate that riparian corridor land cover consists of more grassland/cropland (60.4%) than forest/wetland (37.5%). Percentages for the remaining categories of urban and water are 0.1% and 1.9% respectively. Of the 12 eleven digit hydrologic units within the watershed, the Truman Reservoir-South Grand Unit has the highest combined percentage of forest/wetland corridor land cover at 48.9%. It also ranks as having the lowest combined percentage of grassland/cropland corridor land cover at 48.1%. On the other end of the spectrum, the Camp Branch Unit has the lowest combined forest/wetland land cover at 29.1% and the highest combined percentage of grassland/cropland at 68.0. Table Hc02 gives riparian corridor land cover/land use percentages for all eleven digit hydrologic units within the watershed as well as percentages for the total watershed. Figure Hc02 presents a graphic representation of riparian corridor land cover for all drainage units within the watershed. It is important to note that National Wetlands Inventory data as well as anecdotal evidence suggests that the percentage of watershed area in wetlands is substantially higher than the land cover data indicates. This is especially true in the lower portions of the South Grand River and Big Creek (Bayless, Personal Communication)

In addition to analysis of riparian corridor within hydrologic units, riparian corridor land cover was analyzed for all fourth order (Horton) and larger streams within the watershed. Results of a comparison of combined forest/wetland to combined grassland/cropland land cover for fourth order and larger streams, indicates that 12 out of 48 streams have corridors with larger combined percentages of grassland/cropland than forest/wetland. The Newberry Branch corridor has the highest percentage of grassland/cropland at 75.1% while the Tebo Creek corridor has the highest percentage of forest/wetland at 85.2%. The South Grand River corridor has combined percentages of forest and wetland at 70.3% and combined grassland cropland at 20.5%. Results for the remaining fourth order and larger streams are given in Table Hc03.

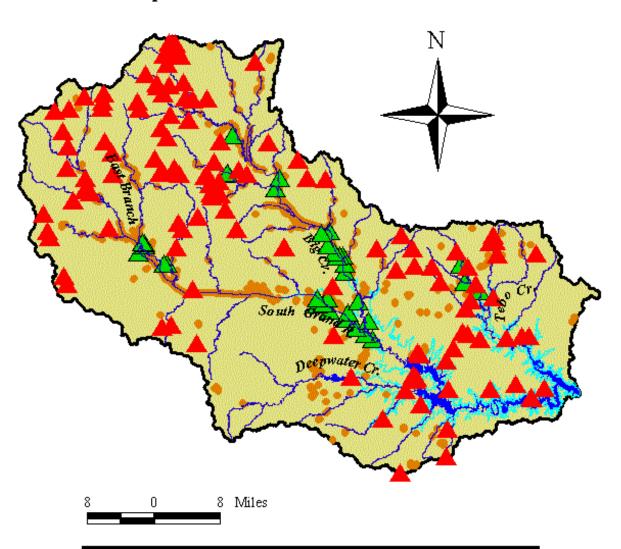
### Wetlands

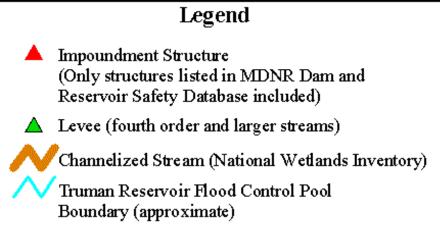
Wetlands are a valuable resource within watersheds. Wetlands help to filter out sediment and other non-point source pollutants before overland runoff reaches streams. Wetlands adjacent to rivers and streams also provide nursery habitat for young fish and amphibians as well as habitat for a variety of other animals including waterfowl and songbirds.

Analysis of MoRAP (1999) Missouri land cover data and KARS (1993) Kansas land cover data indicates that approximately 0.1% of the South Grand Watershed is in wetlands. Wetland land cover within the riparian corridor in the watershed is slightly higher at 0.2 %. The 1998 Missouri Unified Watershed Assessment indicates a substantially higher percentage of watershed acreage in wetlands in the watershed at 6.6% and lists a loss of wetlands at 0.1% between 1982 and 1992. The percentage of wetlands provided in the Missouri Unified Watershed Assessment is based on USDA-NRCS 1982 and 1992 National Resources Inventory (NRI) data, not the same data as the previously mentioned riparian corridor landcover analysis.

HC05

Figure Hc01. South Grand River Watershed Impoundments and Channel Alterations





## Figure Hc02. South Grand River Watershed

## Eleven Digit Hydrologic Unit Riparian Corridor Landcover

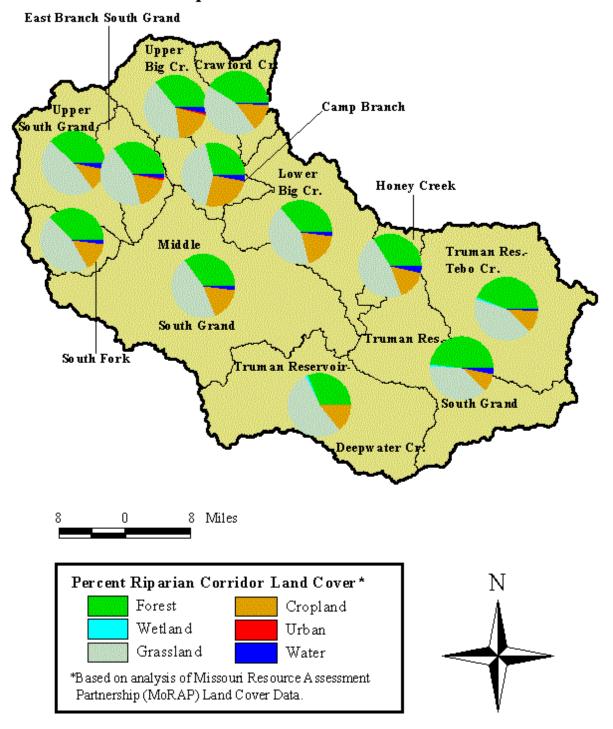


Table Hc01. Inventoried natural communities within the South Grand Watershed in Missouri (MNHP 2003).

<b>Community Type</b>	Sig	Owner	Location Name		
Limestone/Dolomite Talus	N	MDC	Reed (James A) Memorial WA		
Freshwater Marsh	Е	MDC	Bittern Bottoms CA		
Wet-Mesic Bottomland Forest	E	Private	Eightmile Creek Bottom		
Mesic Bottomland Forest	Е	Private	Crooked Branch Forest And Oxbow		
Limestone Glade	N	MDC	Reed (James A) Memorial WA		
Limestone Glade	N	MDC	Reed (James A) Memorial WA		
Limestone Glade	N	MDC	Reed (James A) Memorial WA		
Limestone Glade	N	Private	East Branch Glade		
Dry-Mesic Limestone/	N	Private	Camp Branch Prairie		
Dolomite Prairie					
Dry-Mesic Limestone/	E	Private	Sugar Creek Prairie		
Dolomite Prairie					
Dry-Mesic Limestone/	N	MDC	Dorsett Hill Prairie CA		
Dolomite Prairie					
Dry-Mesic Limestone/	N	Private	South Fork Prairie		
Dolomite Prairie					
Dry-Mesic Limestone/	E	Private	Farnsworth Prairie		
Dolomite Prairie					
Dry-Mesic Sandstone/	S	Private	Cooper Creek Prairie		
Shale Prairie					
Dry-Mesic Sandstone/	E	Private	Triangle Prairie		
Shale Prairie					
Dry-Mesic Sandstone/	E	Private	Dirt Lane Prairie		
Shale Prairie					
Hardpan Prairie	E	Private	Top Of 2 Creeks Prairie		
Prairie Swale	S	Private	Snowball Hill Prairie		
Prairie Swale	E	Private	West Dolan Prairie		
Dry Limestone/Dolomite Woodland	Е	MDNR	Harry S. Truman SP		
Dry Limestone/Dolomite Woodland	S	U.S. Army	Deer Ridge Savanna		

Sig (significance): S=Significant, E=Exceptional, N=Notable

Owner: MDC=Missouri Department of Conservation, MDNR=Missouri Department of Natural Resources.

Table Hc02. Percent riparian corridor land cover for eleven digit hydrologic units within the South Grand Watershed. Data is based on analysis of Missouri Land Cover Data (MoRAP 1999) and Kansas land cover data (KARS 1993).

Unit Name	FOR	WET	GRS	CRP	URB	WAT
Upper South Grand	37.9	<0.1	46.8	12.5	0.3	2.5
South Fork	37.5	0.0	45.6	15.3	0.0	1.6
East Branch South Grand	35.1	0.0	44.3	17.8	0.8	1.9
Upper Big Creek	36.2	0.0	41.3	18.8	0.6	3.1
Crawford Creek	40.8	0.0	43.7	14.4	<0.1	1.1
Camp Branch	29.2	0.0	42.1	25.9	0.0	2.9
Middle South Grand	35.3	0.0	46.4	17.1	<0.1	1.2
Honey Creek	34.1	0.0	47.1	15.5	0.0	3.3
Lower Big Creek	36.3	0.0	43.0	18.7	<0.1	2.0
Truman Reservoir-Deepwater Creek	30.8	0.6	53.7	13.8	<0.1	1.0
Truman Reservoir-Tebo Creek	43.6	0.7	43.2	10.6	<0.1	1.9
Truman Reservoir-South Grand	48.1	0.9	38.9	9.2	0.2	2.9
South Grand Watershed	37.3	0.2	45.2	15.2	0.1	1.9

FOR =Forest, WET=Wetland, GRS=Grassland, CRP=Cropland, URB=Urban, WAT=Water

Table Hc03. Percent riparian corridor land cover for fourth order and larger streams within the South Grand Watershed. Streams having combined percentages of grassland and cropland exceeding combined percentages of forest and wetland are in *bold italics*. Data is based on analysis of Missouri Land Cover Data (MoRAP 1999) and Kansas land cover data (KARS 1993).

Stream Name	FOR	WET	GRS	CRP	URB	WAT
Barker Cr.	62.9	3.8	25.0	7.6	0.0	0.6
Bear Cr. (1)	49.4	1.5	39.6	8.4	0.0	1.1
Bear Cr. (2)	53.9	0.0	33.9	12.2	0.0	0.0
Big Cr.	68.7	0.0	16.9	13.7	0.2	0.4
Big Deer Cr.	45.3	0.0	42.0	12.3	0.0	0.4
Big Otter Cr.	29.4	5.0	54.8	10.2	0.0	0.5
Camp Br.	55.9	0.0	24.7	19.4	0.0	0.1
Clear Cr. (2)	48.3	0.0	26.5	21.4	0.0	3.8
Cooper Cr.	54.8	4.0	35.5	5.2	0.0	0.5
Crawford Cr. (Old Channel)	48.9	0.0	24.0	27.0	0.0	0.1
Crawford Cr. (New Channel)	41.3	0.0	28.5	30.2	0.0	0.0
Deepwater Cr.	65.8	1.5	11.7	9.2	0.0	10.1
East Br. (S. Grand OC)	33.8	0.0	27.9	38.3	0.0	0.0
East Br. Crawford Cr.	59.0	0.0	29.3	10.4	0.0	1.2
East Br. South Grand R.	47.1	0.0	32.4	20.5	0.0	0.1
East Cr.	60.9	0.0	20.4	18.2	0.0	0.5
East Fork Honey Cr.	52.4	0.0	37.1	10.3	0.0	0.2
East Fork Tebo Cr.	60.8	0.0	34.2	4.9	0.0	0.1
Eightmile Cr.	60.2	0.0	29.8	9.7	0.0	0.3
Elk Fork	49.3	0.0	40.4	10.3	0.0	0.0
Honey Cr.	56.4	0.0	30.3	12.2	0.0	1.1
Knob Cr.	56.0	0.0	30.2	13.7	0.0	0.0
Little Otter Cr.	61.2	3.3	31.2	4.3	0.0	0.0
Lost Cr. (1)	47.2	0.0	30.8	21.0	0.0	0.9
Louse Run	69.0	0.0	16.0	15.0	0.0	0.0
Marshall Cr.	55.4	6.3	27.6	8.7	0.0	2.0
Massey Cr.	61.0	0.0	31.8	7.2	0.0	0.0
Middle Big Cr.	50.9	0.0	32.1	13.7	0.7	2.6
Middle Fork Tebo Cr.	62.4	0.0	31.4	1.1	0.0	5.0
Muddy Cr.	58.6	0.0	29.8	9.6	0.6	1.4
Newberry Br.	24.9	0.0	69.2	5.9	0.0	0.0
Norris Cr.	45.3	0.0	32.8	19.6	0.0	2.2
North Deepwater Cr.	64.6	0.0	24.0	11.4	0.0	0.0
Panther Cr.	49.9	0.0	32.4	17.6	0.0	0.1
Poney Cr.	55.2	0.0	34.7	9.7	0.2	0.2
SGW044	49.0	0.0	31.4	19.1	0.0	0.5
SGW072	57.2	0.0	35.8	7.0	0.0	0.0

Sand Cr.	58.6	0.0	27.1	13.7	0.1	0.5
South Deepwater Cr.	53.4	0.0	33.6	13.1	0.0	0.0
South Fork	43.9	0.0	23.2	32.8	0.0	0.1
South Grand R.	70.3	0.0	14.2	6.3	0.0	9.2
Sugar Cr.	58.9	0.0	25.8	15.0	0.0	0.4
Tebo Cr.	82.7	2.5	4.1	1.0	0.0	9.8
Wade Cr.	58.0	0.0	34.6	6.9	0.0	0.5
Walnut Cr.	58.4	0.0	35.4	5.7	0.0	0.5
West Br. Crawford Cr.	54.2	0.0	33.5	12.1	0.0	0.2
West Fork Tebo Cr.	55.7	0.0	33.6	10.7	0.0	0.0